Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Advanced Reservoir Engineering **Semester: 2nd**
Program: M.Tech. Petroleum Engineering **Time : 03 hrs.**
Course Code: PEAU 7017 **Max. Marks: 100**

Instructions: Assume if any data missing.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Classify and discuss aquifer on the basis of outer boundary conditions.	**4**	**CO1**
Q 2	Calculate the water influx rate e_w in a reservoir whose pressure is stabilized at 3000 psi. Data given: Initial reservoir pressure = 3500 psi, dN_p/dt = 32,000 STB/day, B_o = 1.4 bbl/STB, GOR = 900 scf/STB, R_s = 700 scf/STB, B_g = 0.00082 bbl/scf dW_p/dt = 0, B_w = 1.0 bbl/STB	**4**	**CO1**
Q 3	Explain the direct line drive and staggered line drive flooding patterns.	**4**	**CO2**
Q 4	Discuss the five spot and nine spot flooding patterns with suitable diagrams.	**4**	**CO2**
Q 5	Elaborate the crestal and basal injection flooding patterns with the help of diagrams.	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	The pressure history of a water-drive oil reservoir is given below: t (days) / p (psi) 0 / 3000 100 / 3450 200 / 3410 300 / 3380 400 / 3340 The aquifer is under a steady-state flowing condition with an estimated water influx constant of 130 bbl/day/psi. Calculate the cumulative water influx after 100, 200, 300, and 400 days using the steady-state model.	**10**	**CO1**
Q 7	Derive the fractional flow equation for immiscible fluids with suitable assumptions.	**10**	**CO2**
Q 8	Differentiate between the instantaneous GOR, solution GOR and cumulative GOR.	**10**	**CO3**

<table>
<tr><td>Q 9</td><td>With the help of flowchart, briefly explain the modern reservoir management process.</td><td>10</td><td>CO4</td></tr>
<tr><td colspan="4">SECTION-C
(2Qx20M=40 Marks)</td></tr>
<tr><td>Q 10</td><td>A volumetric depletion-drive reservoir exists at its bubble-point pressure of 3000 psi. Detailed fluid property data are listed by Craft and his coauthors and given here at only two pressures.

<table>
<tr><th>Fluid property</th><th>p_b = 3000 psi</th><th>p = 2700 psi</th></tr>
<tr><td>B_o, bbl/STB</td><td>1.498</td><td>1.463</td></tr>
<tr><td>R_s, scf/STB</td><td>721</td><td>669</td></tr>
<tr><td>B_g, bbl/scf</td><td>0.001048</td><td>0.001155</td></tr>
<tr><td>μ_o, cp</td><td>0.488</td><td>0.539</td></tr>
<tr><td>μ_g, cp</td><td>0.0170</td><td>0.0166</td></tr>
<tr><td>X (p)</td><td>0.00018</td><td>0.00021</td></tr>
<tr><td>Y (p)</td><td>0.00328</td><td>0.00380</td></tr>
<tr><td>Z (p)</td><td>0.00045</td><td>0.00050</td></tr>
</table>

The following additional information is available:
N = 58 MMSTB, S_{wi} = 19%, S_{oi} = 81%

<table>
<tr><th>S_g</th><th>K_{rg}/k_{ro}</th></tr>
<tr><td>0.10</td><td>0.010</td></tr>
<tr><td>0.20</td><td>0.065</td></tr>
<tr><td>0.30</td><td>0.200</td></tr>
<tr><td>0.50</td><td>2.000</td></tr>
<tr><td>0.55</td><td>3.000</td></tr>
<tr><td>0.57</td><td>5.000</td></tr>
</table>

Calculate the cumulative oil production for a pressure drop of 300 psi, i.e., at 2700 psi.</td><td>20</td><td>CO3</td></tr>
<tr><td>Q 11</td><td>Throughout the life of a reservoir, from exploration to abandonment, an enormous amount of data are required. Listed them and explain with the help of flowchart.
OR
With the help of flowchart, step by step explain the reservoir life process.</td><td>20</td><td>CO4</td></tr>
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